PHOENIX FIRE CODE SUMMARY

Plan Review and Inspection of LP-Gas Containers for Vapor Service (<2,000 Gallons w.c.)

REFERENCED FIRE CODE 1997 Uniform Fire Code, Article 82, and NFPA 58, LP-Gas Code, 2001 edition as adopted and amended by the City of Phoenix.

SCOPE OF THIS FIRE CODE SUMMARY An explanation of the requirements for submitting plans, construction and inspection of stationary LP-Gas containers. These requirements are for horizontal stationary (ASME) or portable (DOT) LP-Gas containers with a volume of 120 gallons w.c up to 2,000 gallons w.c. used exclusively for vapor service.

HAZARDS OF LIQUEFIED PETROLEUM GASES (LP-Gas)

LP-Gas is flammable liquefied compressed gas. Its uses include fuel gas for residential and commercial heating and cooling applications. LP-Gas has an expansion ratio of approximately 280:1 – this large expansion ratio means that small release of the liquid can produce a large volume of vapor. LP-Gas has a flammable range of 2.15-9.60% when mixed with air. The gas is heavier than air – because of its vapor density NFPA 58 requires certain controls for ignition sources and locations for regulators that must be adhered to.

COMMONLY USED HAZARDOUS MATERIALS AND THEIR CLASSIFICATION

Chemical Name	CAS No.	PFC Classification	704H	704F	704R
Liquefied Petroleum Gas	Mixture	Flammable Liq. Comp. Gas	1	4	0

SUMMARY OF FIRE CODE REQUIREMENTS

REQUIRED PLAN REVIEW INFORMATION

REQUIREMENT	SECTION	COMPLIANT
<u>*Aboveground ASME Container.*</u> Submit a minimum of 2 copies the following information: ❑ Demonstrate that the container meet the ASME Boiler and Pressure Vessel Code requirements for an Unfired Pressure Vessel. ❑ Provide the diameter and length of the ASME container so the pressure relief device flow rate can be calculated. ❑ Provide the maximum allowable working pressure (MAWP) and design temperature (DT) of the container.	2.2.6.3	YES ❑ NO❑
<u>*Underground ASME Container.*</u> Submit a minimum of 2 copies the following information: ❑ Is the container listed by Underwriters Laboratories, Factory Mutual Global, or other nationally recognized testing laboratories. ❑ Provide the diameter and length of the ASME container so the pressure relief device flow rate can be calculated. ❑ Provide the maximum allowable working pressure (MAWP) and design temperature (DT) of the container.	2.2.6.3	YES ❑ NO❑

PHOENIX FIRE CODE SUMMARY

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<u>*U.S. D.O.T. Cylinders:*</u> Submit a minimum of 2 copies the following information: ❑ Manufacturer specifications or data sheets that demonstrate the containers meet the requirements of 49 CFR 171-177. ❑ If containers will be connected to a manifold, provide the manufacturer specifications or data sheets when manual or automatic switch-over valves are installed.	2.2.6.3	YES ❑ NO❑
<u>*Container Appurtenances.*</u> Submit a minimum of 2 copies of the following information: ❑ The size, flow rate, and operating pressure of the pressure relief devices and its listing information.	2.3.3.1	YES ❑ NO❑
❑ The diameter, pressure rating and listing for the manual shutoff valve. The selected valve shall have a minimum working pressure of 125 PSIG.	2.4.4.1	YES ❑ NO❑
<u>*Vapor Piping:*</u> Submit a minimum of 2 copies of the following information: ❑ If metallic pipe is installed, provide the material of construction, the pipe diameter, schedule and the method of assembly (e.g., threaded, flanged, welded or brazed).	2.4.2	YES ❑ NO❑
❑ If polyethylene pipe and fittings are used, provide information demonstrating that they comply with ASTM D2513, *Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings*. Data sheets for factory assembled service risers and mechanical fittings should also be included so that equipment compatibility can be confirmed.	3.2.16	YES ❑ NO❑
❑ When metallic piping is installed underground provide PFD with the information that addresses how cathodic protection is provided.	3.2.15.9	YES ❑ NO❑
❑ If metallic piping is installed aboveground provide information about the type of pipe hangers or supports and the maximum hanger or support spacing.	3.2.15.7	YES ❑ NO❑
<u>*LP-Gas Regulators:*</u> Submit a minimum of 2 copies of the following information: ❑ Manufacturer data sheets for each type of regulator used in the system. The data sheets should demonstrate that the regulators are listed as meeting UL 144, *Standard for LP-Gas Regulators*. (NFPA 58, Section 2.5.7)	2.5.7	YES ❑ NO❑
<u>*Site Plan:*</u> Submit a minimum of 2 copies that illustrate the following details: ❑ The location of the LP-Gas containers, the approximate vapor piping routing and the approximate location of the regulators. ❑ The location of the container and its separation distances from buildings, adjacent LP-Gas containers and lines of adjoining properties that can be built on. ❑ When ASME aboveground LP-Gas containers will be located near dwelling eaves or overhangs, provide a cross sectional detail illustrating compliance with NFPA 58, Section 3.2.2.2 (g).	3.2.2	YES ❑ NO❑

PHOENIX FIRE CODE SUMMARY

Plan Review and Inspection of LP-Gas Containers for Vapor Service (<2,000 Gallons w.c.)

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❑ Aboveground containers and cylinders are installed on concrete pads to protect the container from bottom corrosion. ❑ For underground containers a note concerning the type of backfill material is required. ❑ For underground containers provide a detail explaining how cathodic protection is provided. ❑ The drawing shall indicate where the bobtail truck will be parked. Phoenix Fire Department will not approve plans that illustrate a bobtail parking in a public right-of-way and dispensing fuel on private property.	4.2.3.3	YES ❑ NO❑
FIRE DEPARTMENT INSPECTION		
REQUIREMENT	**SECTION**	**COMPLIANT**
<u>Aboveground ASME Container & DOT Cylinder Location</u>		
❑ The separation distance from the LP-Gas container to buildings and lines of property that can be built upon shall meet the distance requirements in Table 3.2.2.2. *INSPECTION NOTE: At consumer sites the 25 foot separation distance requirement in Table 3.2.2.2 may be reduced to 10 feet for a single container of 1,200 gallons or less w.c. when the container is 25 feet from any LP-Gas container with a water capacity of more than 125 gallons w.c. (See exception 2, Section 3.2.2.2)*	3.2.2.2	YES ❑ NO❑
❑ The location of ASME container & DOT cylinder pressure relief devices, the fixed maximum liquid level gauge and fill connection is at least 10 feet from any fixed source of ignition, openings into direct-vent appliances (e.g., central or wall mount air conditioners) and any mechanical ventilation air intake opening. *INSPECTION NOTE: For DOT cylinders that are exchanged and not filled on site these separation distances are reduced to 5 feet. (See Table 3.2.2.2 (d))*	3.2.2.2(d)	YES ❑ NO❑
❑ For wood frame structures with exterior eaves, verify that the LP-Gas container relief valve is located a distance equal to 50% of the container's length from the edge of the eave.	3.2.2.2(g)	YES ❑ NO❑
❑ Loose or piled combustible material and dead vegetation are located at least 10 feet from the container.	3.2.2.6(b)	YES ❑ NO❑
❑ .The LP-Gas container is located at least 20 feet from any aboveground storage tank that contains Class I, II or III-A flammable or combustible liquids.	3.2.2.6(e)	YES ❑ NO❑
❑ The aboveground LP-Gas container or any of its parts shall not be located within 6 feet of a vertical plane beneath overhead power lines that are over 600 volts nominal.	3.2.2.2(j)	YES ❑ NO❑

PHOENIX FIRE CODE SUMMARY

Plan Review and Inspection of LP-Gas Containers for Vapor Service (<2,000 Gallons w.c.)

REQUIREMENT	SECTION	COMPLIANT
❑ The container is installed on a concrete or masonry footing or foundation and does not elevate the container more than 12 inches above grade.	3.2.6.1(d)	YES ❑ NO❑
Pressure Relief Devices for Aboveground Installations		
❑ The pressure relief device is in direct communication with the vapor space.	3.2.11.1	YES ❑ NO❑
❑ The pressure relief device flow rate equals the flow rate calculated during the plan review or meets the flow rate requirement in Table 2.3.2.4 (a) and the set to open pressure is equal to or less than the MAWP of the ASME container.	2.3.2.4	YES ❑ NO❑
❑ A shutoff valve is not installed between the container and the pressure relief device.	3.2.11.9	YES ❑ NO❑
❑ A rain cap or other means is provided to minimize the possibility of water entering the pressure relief device. The rain cap or protective means shall not restrict the flow of from the pressure relief device.	3.2.11.4	YES ❑ NO❑
Underground ASME Containers		
❑ The container shall be buried at least 12 inches below grade. In areas subject to vehicle traffic the depth of burial shall be at least 18 inches. This dimension is measure from the lowest grade point to the top of the shell of the pressure vessel.	3.2.9.1(b)	YES ❑ NO❑
❑ If vehicle traffic can be expected within 10 feet of the protective collar for the valve riser, impact protection shall be provided. Impact protection shall meet PFC 8001.11.3.	3.2.9.1(c)	YES ❑ NO❑
❑ Containers shall be set level with the valve riser perpendicular with the adjacent grade. *INSPECTION NOTE: If the container is not perpendicular this can result in the container possibly being overfilled.*	3.2.9.1(i)	YES ❑ NO❑
❑ Containers shall be provided with a means of corrosion protection. If the container is coated, and the coating is damaged, the coating shall be repaired before it is backfilled. *INSPECTION NOTE: If sacrificial anodes are used confirm that the weight and number of anodes equals those presented on the plans*	3.2.9.1(h)	YES ❑ NO❑
❑ The backfill material shall be free of rocks and abrasive materials that may damage the container.	3.2.9.1(i)	YES ❑ NO❑
Pressure Relief Devices		
❑ The pressure relief device is in direct communication with the vapor space.	3.2.11.1	YES ❑ NO❑
❑ Pressure relief devices for underground containers are permitted to be derated. NFPA 58 allows the relief valve flow rate to be reduced to 30% of the container's surface area. The pressure relief device flow rate shall equal the flow rate calculated during the plan review or meets 30% of the flow rate requirement in Table 2.3.2.4 (a) and the set to open pressure is equal to or less than the MAWP of the ASME container.	2.3.2.4 (c)	YES ❑ NO❑

PHOENIX FIRE CODE SUMMARY

Plan Review and Inspection of
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❑ A shutoff valve is not installed between the container and the pressure relief device.	3.2.11.9	YES ❑ NO❑
❑ A rain cap or other means is provided to minimize the possibility of water entering the pressure relief device. The rain cap or protective means shall not restrict the flow of from the pressure relief device.	3.2.11.4	YES ❑ NO❑
Pressure Regulators		
❑ Pressure regulators shall be directly attached or attached by a flexible connector to the vapor outlet of the valve. *INSPECTION NOTE: The maximum length of a flexible connector is 36 inches.*	3.2.12.2	YES ❑ NO❑
❑ The regulator discharge opening shall be located at least 3 feet from any building opening below the level of discharge and 5 feet from any fixed source of ignition, openings into direct-vent appliances (e.g., central or wall mount air conditioners) and any mechanical ventilation air intake opening.	3.2.12.5	YES ❑ NO❑
❑ PVC pipe may be used to meet the discharge opening separation distances described above. However, only PVC pipe and fittings that are listed as meeting UL 651, Schedule 40 and 80 PVC Conduit may be used. Any other types of PVC materials are not allowed.	2.4.8	YES ❑ NO❑
❑ The discharge of a regulator installed on an underground container shall be above the highest probable water level.	3.2.9.1(g)	YES ❑ NO❑
Vapor Piping – Metallic Pipe, Tube & Fittings		
❑ Verify that pipe and fittings are at least schedule 40. The pipe can be assembled using threaded or welded assembly methods. *INSPECTION NOTE: If the piping was welded, obtain the welder's certification so the plan examiner can review it.*	3.2.15.2	YES ❑ NO❑
❑ The minimum burial depth for metallic piping is 12 inches. If the piping is in an area subject to excavations (flower beds, gardens, etc.) the minimum burial depth is 18 inches.	3.2.15.8	YES ❑ NO❑
❑ Verify that buried pipe and fittings are provided with corrosion protection as described on the approved plans.	3.2.15.9	YES ❑ NO❑
❑ LP-Gas piping shall not be used as a grounding electrode.	3.2.15.10	YES ❑ NO❑
❑ Aboveground piping shall be adequately anchored and supported. Approved plans will include a schedule of the type of pipe supports and the maximum span between supports based on the pipe diameter.	3.2.15.6	YES ❑ NO❑

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REQUIREMENT	SECTION	COMPLIANT
Vapor Piping – Polyethylene or Polyamide Pipe, Tube & Fittings		
❑ The piping is installed outdoors and underground. Any other uses are prohibited.	3.2.16.1	YES ❑ NO❑
❑ The minimum burial depth for metallic piping is 12 inches. If the piping is in an area subject to excavations (flower beds, gardens, etc.) the minimum burial depth is 18 inches.	3.2.16.2	YES ❑ NO❑
❑ Obtain documentation demonstrating that factory assembled risers were pressure tested by the manufacturer.	3.2.16.5	YES ❑ NO❑
❑ An electrically continuous corrosion-resistant tracer wire or pipe tracing tape shall be buried with the piping. At least one end of the wire or tape shall be brought aboveground at a building wall or at the riser.	3.2.16.9	YES ❑ NO❑

REQUIRED FIRE CODE PERMITS

Commercial businesses that install LP-Gas containers with a water capacity of more than 125 gallons shall be required to obtain a Phoenix Fire Department permit for the Storage, Handling and Use of Liquefied Petroleum Gases. The permit application and hazardous materials inventory statement (HMIS) is available on the internet at www.ci.phoenix.az.us/FIRE/hazmatapp.pdf . The permit application and HMIS should be remitted at the time of plan review. A storage, handling and use permit is not required for LP-Gas installations with a water capacity of less than 2,000 gallons at single family dwellings.

OTHER REQUIRED CITY OF PHOENIX PERMITS

Installation of a fuel gas pipeline to appliances or equipment requires a plumbing permit pursuant to the Phoenix Plumbing Code.

The scope of the Fire Department's inspection stops at the vapor outlet of the container. The installation of two stage regulators and piping downstream of the vapor outlet is the responsibility of the Development Services Department. To ensure a timely inspection by Development Services Department staff, it is recommended that the Fire Department inspect the LP-Gas container and issue a conditional (yellow tag) or final (green tag) approval before calling for the fuel gas line inspection.

The fee for the plumbing permit is calculated using the value of the project, building, or area. To obtain an accurate fee calculation, contact the Development Services Department Business Customer Service Center at 602-534-2000.

HOW CAN I OBTAIN MORE INFORMATION?

If this fire code summary does not answer your questions, please feel free to contact one of the Phoenix Fire Department's fire protection engineers or fire plan examiners at 602-262-6771. E-mail inquires can be sent to phoenix.fire.prevention@phoenix.gov

Requests for information about Building, Plumbing, Mechanical and Electrical Code requirements should be directed to the Development Services Department at 602-534-2000.

PHOENIX FIRE CODE SUMMARY

Plan Review and Inspection of
LP-Gas Containers for Vapor Service (<2,000 Gallons w.c.)

Telephony or e-mail messages regarding particular code requirements to the Phoenix Fire Department are not official interpretations. An official interpretation requires a plan review or written correspondence that requests an official interpretation, the referenced code section(s) **AND** includes sufficient information to interpret if the applicable code section(s) applies.

PREPARED BY

Scott A. Stookey, Special Hazards Unit

Date: June 14, 2003

Revisions:

h://sstookey/firecodesummary/residential LPG installations.doc